

Interactive comment on “Atmospheric CO₂ monitoring with single-cell NDIR-based analyzers” by B. B. Stephens et al.

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We thank the two anonymous reviewers for their work and their favorable comments on our manuscript. The reviewers' questions and requested revisions are all relatively minor and our responses to them are below.

Anonymous Referee #1

>Comment 1: p. 4331 line 3: “Flow restrictions downstream of the LI-820 are minimal and sample cell pressure is closely tied to ambient”. According to Fig 1 the sample flow passes through each two mole sieve cartridges and Nafion driers and a 40 m filter in the AIRCOA set up. Does this not cause any flow restriction?

C1778

We replace the metal frits that come with the mole sieve cartridges with glass wool to minimize the flow restriction, but yes there is typically still a pressure drop of up to 1 kPa at 100 sccm between the LiCor 820 cell and ambient. We will add text to this effect to the paper.

>Comment 2: line 23: 1 min of data following the valve switch is ignored.. If with a flushing time of 2.5 min the first min is ignored this does not leave ≥ 100 s data averaging time.

Good point, we will change the text in Section 2.4.1 to say ≥ 90 s.

>Comment 3: p. 4337 section 2.4.4: A temperature variability of 0-1.3 C between calibrations is specified and a temperature sensitivity of 0.1 ppm / C but an associated error of 0-0.07 ppm for the uncorrected version. Why not 0.13 ppm?

This calculation involved some assumptions that we did not adequately explain. Specifically, we assume a linearly trending temperature change of 1.3 C between two calibrations and for every measurement (in the PSU system) we average the prior and following calibrations corresponding to a representative temperature in the middle of this trend. Thus, the furthest a single measurement would be from the average calibration temperature would be at the start or end of the between-cal period and these would only be different by half of the full temperature trend, or $1.3/2 \cdot 0.1 = 0.07$ ppm. We will add text to clarify this calculation.

>Comment 4: Section 2.4.7: The empirical correction function to account for the memory effect due to incomplete flushing is probably only applied for a certain period of flushing time after the valve switch?

The value quoted for the AIRCOA system is specifically for the average of the 100 sec period starting 50 seconds after the valve switch, so yes we only apply it for this period. If we ignored more data or switched less frequently the correction would be smaller, but with the AIRCOA we always switch and average at these times.

C1779

>Comment 5: p. 4340/4353: Section 3.1, Fig 2a: If tests B-F are all similar, over which period of time have they been performed?

The tests were conducted over a period of approximately 1 week. The length of time and CO₂ ranges of the tests were: Test A (400 min; 390 – 465 ppm), Test B (80 min; 382 – 385 ppm), Test C (80 min; 384 – 388 ppm), Test D (145 min; 405 – 415 ppm), Test E (80 min, 390 – 415 ppm), and Test F (75 min; 372 – 378). We will edit the text and figure caption to include this information.

Anonymous Referee #2

>Comment 1: It would be helpful if the authors stated whether the AIRCOA system uses the same or different in-line regulators as the PSU systems. (Pg 4332)

They use the same and we will clarify this in the text.

>Comment 2: The authors should consider stating that the WMO CO₂ scale is a mole fraction scale.

We will make this addition.

>Technical correction 1: Line 23, pg 4331. “data following the valve is ignored” should read . “data following the valve switch is ignored”

We will make this correction.

>Technical correction 2: Line 8, pg 4340. “ An LI-7000” should read “A LI-7000”

We will make this correction.

>Technical correction 3: Pg4353. Fig 2 requires improvement as the text in panel (b) is too small, the legend text is too small, and the axis text is not consistent with that in panel (a).

We will increase the size of the text in panel (b) and its legend, and we will make both x-axes consistent.

C1780

Other planned changes:

Since submitting the paper we learned of an additional publication on isotope effects on NDIR measurements (Tohjima et al., JGR 2009) and we plan to add this citation and a reference to it in the text. We will also add several people to our acknowledgements who were inadvertently omitted before.

Interactive comment on Atmos. Meas. Tech. Discuss., 4, 4325, 2011.

C1781